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ABSTRACT

This study sought to determine whether there would be any relationship between age and success for students arbitrarily placed in "college-preparatory" beginning algebra on the basis of the ACT mathematics score. The study was conducted during the first term of 1985-86 at Broward Community College, in Florida. A list of 78 students placed in the course was provided by the registrar. A chi-square analysis was used to determine any significant difference between success in the course and age (under 20 versus 20 or older). Separate chi-square tests were used to determine any differences between success in the course and sex, and success and race. No significant difference was found between success in the course and age. Furthermore, no significant differences were found between success and race or success and sex. Recommendations for additional research were included. (MNS)

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AN INVESTIGATION OF THE SUCCESS RATES OF OLDER VERSUS YOUNGER STUDENTS PLACED INTO COLLEGE-PREPARATORY MATHEMATICS ON THE BASIS OF ACT SCORES

Politics, Law and Economics of Higher Education

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ABSTRACT

The purpose of this study was to determine if there was any relationship between age and success for students arbitrarily placed in "college-preparatory" Beginning Algebra on the basis of their ACT mathematics score. The study was conducted during Term I, 1985-1986, on the South Campus of Broward Community College.

A list of students placed in the course on the basis of their ACT mathematics score and course results was provided by the college registrar. A chi-square analysis was used to determine any significant difference between success in the course and age (under 20 versus 20 or older). Separate chi-square tests were used to determine any differences between student success in the course and sex and success and race. For each test, the significance level was set at .05.

The Null Hypothesis was stated such that there would be no significant difference between success in the course and age. Analogous corollary hypotheses were stated for success in regard to sex and success in regard to race.

After analysis of the data, the Null Hypothesis was confirmed. Furthermore, no significant differences between success and race or success and sex were found.

It was found that students over age 25 were somewhat more successful than those over 20 as well as those under 20. Females were found to outnumber males by over two to one and be equally successful. Minority students appeared to be at least as successful as other students but analysis was confounded due to a small sample.

Recommendations derived from this study were that: (1) the study be expanded to increase the sample size, particularly of minorities and students over age 25; (2) an investigation be undertaken to determine if women significantly outnumber men in all math courses; (3) other "college-preparatory" courses be included in a future study; (4) future studies utilize statistical methods which would allow for multiple factor analysis; and (5) an investigation of the low success rate of students placed in Beginning Algebra on the basis of their ACT scores as compared to all students in the same course be investigated and remedial steps initiated.

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INTRODUCTION

Beginning with the Fall Term, 1985, all community college and state universities in Florida were required by the State to choose one of four standardized tests to be used exclusively as a placement instrument in mathematics. Furthermore, the State directed that students scoring below a certain level on any of these tests be placed in a below-college level, non-credit math course designated "college preparatory."

College counselors, administrators and faculty at Broward Community College (BCC) realized the need to identify the best placement tool available. Partially due to the fact that the American College Test (ACT) was already part of the placement process, the college selected the ACT to fulfill the state requirement. The purpose of this paper was to determine if there was any relatioship between age and success for students placed in "college-preparatory" Beginning Algebra on the basis of their ACT mathematics score.

A list of all BCC South Campus students placed in this course on the basis of their ACT scores was provided by the college registrar. The registrar also provided information on student sex, age, and race. These factors, in view of student success in the course, were examined by using a chi-square statistical analysis.

BACKGROUND & SIGNIFICANCE

The State Board of Education, under the Omnibus Education Act of 1984, required that state colleges and universities adopt one of four state approved assessment tests to be used as a single, mandatory placement instrument for all first time in college degree-seeking students effective Fall, 1985. Students would be placed solely on the basis of that test using state established cut-off scores. The four approved tests were:

1. Scholastic Aptitude Test (SAT).
2. American College Test (ACT).
3. Assessment of Skills for Successful Entry and Transfer (ACT-ASSET).
4. Multiple Assessment Programs and Services (MAPS-Educational Testing Service.

To comply with State law, Broward Community College chose the ACT test as its placement instrument. It was also decided that if a student had previously taken one of the other three tests, those scores would be used and the student would not have to take the ACT.

In conjunction with the mandatory placement and testing program, the Omnibus Education Act of 1984 also created a core of classes designated as "college-preparatory." College-preparatory courses provide high school graduates

who wish to enroll in college credit courses with additional academic preparation before such enrollment. Consequently, students do not receive college credit for courses designated college-preparatory. Students, however, are placed in these courses based on a single test score obtained on the designated placement instrument (e.g., ACT).

The placement process, as well as granting college credit for particular courses, has historically been a function under individual institutional control. But, as Martorana and Bender (1980:31) reported, institutions have steadily lost control of policy issues to outside forces.

In particular, the State of Florida has become a "trend setter" in the area of outcome measurements programs (Kelly, 1985). The State's mandatory placement testing program is one specific example.

Mandatory placement based on a single test score may cause dissension among some students, but mandatory placement into a non-credit course most certainly will be challenged. A student who is misplaced not only suffers a loss of time and money, but through frustration and discouragement could develop a negative attitude toward the college (Martel,1982:2).

Instructors, administrators and counselors at Broward Community College, South Campus, however, are aware of the importance of having a reliable, valid method of placement

for entering students, particularly when the process may result in mandatory assignment to a non-credit course. The purpose of this paper was to determine any significant difference between age and success for students placed in "college-preparatory" Beginning Algebra on the basis of their ACT mathematics score.

The problem of proper placement of new students at Broward Community College was handled by counselors in a variety of ways. High school transcripts, prior experience, departmental interviews, subject area tests and standardized tests such as the ACT were often used. No one indicator alone was believed to be adequate for the purpose of placement.

In attempting to develop an effective placement process for entering freshman, Armstrong (1976:1) found the ACT test to be significantly more helpful when augmented with other sources. Studies of this nature, however, concentrate on a population of recent high school graduates. This is true primarily due to the fact that the ACT is usually taken by prospective high school graduates.

According to information published by the American College Testing Service, the ACT is programmed primarily for the graduating high school student (American College Testing Program,1985:2). In a description of the Mathematics Usage Test (40 items, 50 minutes), the content includes mathematical techniques typically covered in high school

courses. Recency of graduation from high school and, consequently student age, may significantly affect test performance.

According to Mehallis (1985), the average age of a BCC student is about 27.2 whereas the age of a recent high school graduate is around 18. This indicates that the ACT test may not truly reflect the knowledge of "older" students. ACT literature (American College Testing Program, 1985:13) points out that "older" students' scores should be considered uniquely.

> Although older students or 'adults' who have been out of high school for several years and take the ACT assessment typically do not score as high as current high school students, most older students who enter college tend to be more highly motivated and earn higher grades in college than younger students. Colleges that receive A.C.T. score reports for older students should recognize this fact and take it into consideration when reviewing applications of prospective students.

Significantly, the ACT organization encourages students to consider retaking the test to improve scores if they have never before taken a standardized test like the ACT or completed coursework in the areas covered by the ACT more than a year before they took the test.

In a study of "older students," Hansing and Lenning (1973:1) reported that although entrance test scores are generally much lower for older students, they tend to earn much better grades than younger students. Generally, they noted a consistent positive increase in grades with each corresponding increase in age category (p.6). They conclude

that "test scores should obviously be used in a different way for adult students than for younger students" (pp.13-14).

In a report (American College Testing Program, 1973: 264), ACT researchers confirmed the feelings expressed by others when they stated

> Many colleges have noted that their older students obtain higher grades than those predicted from test scores and high school grades. . . . This observation was confirmed in the cases analyzed here.

Similar findings have been documented for other standardized tests. Casserly (1982:2) reported that SAT scores often underpredicted the performance of older students while Moughamian (1971:3) found that successful CLEP performance was affected by age.

Additional discrepencies exist between scores obtained on the math section of the ACT by men as compared to women. Sawyer (1976:9) stated in an ACT research report that "men students generally score higher than women students on the ACT mathematics . . . test." Although similar findings were reported by Munday (1976:9) and Casserly (1982:2), ACT results do not properly reflect potential or success in terms of grade point average (GPA). Gamanche and Novick (1983:14), in a research report for ACT, concluded that a bias against women exists when predictions of two-year cumulative GPA is made using the ACT.

Minority students are another group whose ACT scores may not properly reflect ability or predict success.

Eisenberg (1975:17) remarks that poor results on standardized tests does not mean these students "lack the ability to learn." Persell (1976:20) pointed out that "minority students frequently exhibit characteristics of test anxiety." Further factors possibly affecting test results of minority students include lack of motivation, poor test taking techniques, language difficulties and a generally hostile testing environment (Persell, 1976:21)."

State colleges and universities must comply with state law regarding placement of entering students. Given this fact, college officials should strive to ascertain the most accurate placement instrument. In lieu of conflicting data on the reliability of the ACT as a sole placement instrument, particularly with "older students", community colleges should welcome any information pertaining to this question.

PROCEDURES

The population consisted of a non-random sample of students who were placed in college-preparatory Beginning Algebra on the basis of their ACT mathematics score. The study was conducted during Term I, 1985 at Broward Community College, South Campus. Information concerning the students' ACT scores, age, sex, and race was provided by the college registrar. Each student studied was a first time in college degree-seeking student whose ACT score, as defined by the State, required placement in the course. Specifically, if a students' ACT mathematics score was eight through thirteen, he was placed in the course. These classes also contained students who selected the course or were advised to take it.

Considering success, students were examined on the basis of age (less than twenty years and twenty or older) using a chi-square analysis. Additionally, students were tested on success in regard to sex and success in regard to race.

At the end of Term I, the final grades were compared between the groups as described. Age, sex, and race were the independent variables while the final grades were the dependent variables.

In comparing age and success, the two-by-two matrix had the following four cells:

1. Younger-Successful
2. Younger-Unsuccessful
3. Older-Successful
4. Older-Unsuccessful

In comparing sex and success, the following four cells were used:

1. Male-Successful
2. Male-Unsuccessful
3. Female-Successful
4. Female-Unsuccessful

In comparing race and success, the following four cells were considered:

1. Minority-Successful
2. Minority-Unsuccessful
3. Non-Minority-Successful
4. Non-Minority-Unsuccessful

A significance level of .05 was used in each test.

Definition of Terms

1. Successful- earning a grade of "C" or better for the given term.
2. Older students- those who are twenty or older at the time they took the ACT test.
3. Minority Student- a student identified as black, not of Hispanic origin.

4. Non-Minority Student- a student identified as white, non-Hispanic.

Null Hypothesis

There is no significant difference between age and success in college-preparatory Beginning Algebra for students placed in the course according to State mandated ACT scores.

Corollary Hypotheses

There is no significant difference between sex and success in college-preparatory Beginning Algebra for students placed in the course according to State mandated ACT scores.

There is no significant difference between race and success in college-preparatory Beginning Algebra for students placed in the course according to State mandated ACT scores.

Assumptions

1. Students who withdrew from the course were assumed to be unsuccessful.
2. Motivating factors toward taking the ACT were not addressed in this report.

Limitations

1. The results are limited to students at Broward Community College, South Campus.
2. The sample was not random.
3. The sample size was smaller than desired, particularly for minority students.
4. Due to varying teaching styles, grading systems, and general approaches, success in the course may vary with instructor.

RESULTS

The results of each chi-square test comparing student success to age, sex, and race are highlighted in the following tables. In all cases, students who received a final grade of "C" or better were considered successful. The numbers in parenthesis represent the expected values (computed to the nearest whole number) while the numbers not in parenthesis represent the actual (observed) values.

Table 1

Actual and Expected Values for Age and Success

	Older	Younger	Total
Successful	7 (8)	18 (17)	25
Unsuccessful	17 (16)	36 (37)	53
Total	24	54	78

Table 2

Actual and Expected Values
for Sex and Success

	Male	Female	Total
Successful	6 (7)	18 (17)	24
Unsuccessful	18 (17)	36 (37)	54
Total	24	54	78

Table 3

Actual and Expected Values
for Race and Success

	Minority	Non-Minority	Total
Successful	3 (3)	18 (18)	21
Unsuccessful	8 (8)	39 (39)	47
Total	11	57	68

The significance level for each test was .05. Yate's correction was used due to frequencies less than five. The table value for chi-square at the .05 significance level for one degree of freedom is 3.84. The computed values for chi-square for age/success, sex/success, and race/success were .37, .40, and .13 respectively. In no case did the

calculated value for chi-square exceed the table value. Therefore, the Null Hypotheses were confirmed.

DISCUSSION, IMPLICATIONS, RECOMMENDATIONS

Although the Null Hypothesis concerning success versus age was confirmed, the assertion that "older" students are more successful may have merit. Specifically, the definition of "older students" may be critical. Hansen and Lenning (1973:6) found that there was a consistent positive increase in grades with each corresponding increase in age category. In this study, the number of students over age twenty was too small to subdivide for statistical testing. However, examining the percentage of students over age 25 who were successful shows a higher rate of success when compared to students between twenty and twenty-five (37.5 percent to 28 percent) as well as students under twenty (37.5 percent to 30 percent).

The Null Hypothesis concerning male versus female performance was also confirmed. It was expected that females would score lower on the ACT test but have greater success. In fact, female performance was at about equal to that of males. In contrast to the findings of Thomas (1973: 10), the standardized test (ACT) was no more inaccurate a predictor of success for females than males.

One significant trend discussed in the literature was quite apparent in this study. Not only did females outnumber males in overall enrollment (54 to 24), but 17 of the 25

"older students" were female. Campus-wide, females accounted for slightly over half the total population including both full and part-time students (Martel, 1985:10). The discrepency between overall female enrollment and female mathematics enrollment on the campus indicates that women are a particularly important population subgroup and should be considered a major factor in future planning, recruitment and retention.

Despite the acceptance of the Null Hypothesis concerning minority student success, caution must be exercised when searching for implications due to the relatively small sample in the study. Interestingly, minority students' mean raw scores on the math portion of the ACT test was actually the highest for the three groups. Minority students were no less successful in the course than non-minority students.

One disturbing finding was the exceedingly low success rate for all groups (about 30 percent). Success rates for all students enrolled in the course this term was approximately 40 percent. Possible reasons for this finding may be that many of these students have poor test taking and math study skills, math anxiety and low motivation levels. Nonetheless, students placed in the course by virtue of their ACT scores does represent a group of students in need of much attention.

The recommendations based on the results of this study are as follows:

1. Expand the study to all campuses to increase the sample size, particularly of minorities and students over age 25.

2. Investigate other math courses to determine if women significantly outnumber men. If this is a general trend, inform college officials and formulate a committee to study the impact.

3. Conduct the study using other college-preparatory courses where students have been arbitrarily placed on the basis of their ACT scores.

4. Investigate the abnormally low success rate for this group and institute additional intervention techniques if indicated. These students should receive math anxiety reduction training, instruction on study skills and test taking techniques and a learning styles inventory analysis. Minority students should be placed in the college "Mentor Program."

5. Use a more sophisticated analysis to determine the interaction of several variables at one time.

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